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The effect of physical fitness, breakfast habits, and self-confidence on learning outcomes

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ABSTRACT

This study aims to examine the direct, indirect, and simultaneous effects of physical fitness, breakfast habits, and self-confidence on physical education learning outcomes. A quantitative associative design with a path analysis approach was used. The population consisted of 146 students, with a purposive sample of 50 students. Data were collected through physical fitness tests, questionnaires on breakfast habits and self-confidence, and students' report card scores. Data were analyzed using path analysis at a significance level of 0.05. The findings show that physical fitness has a significant direct effect on learning outcomes (0.435; 18.92%) and a strong indirect effect through self-confidence (total effect 78.49%). Self-confidence also has a significant direct effect (0.564), while breakfast habits show a weaker and non-significant direct effect but a small indirect contribution (3.49%). Simultaneously, all variables significantly influence learning outcomes ($R^2 = 0.886$). Physical fitness and self-confidence are key determinants of learning outcomes, with self-confidence acting as an important mediating variable.



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Introduction

Physical education plays an important role in supporting students' physical, cognitive, emotional, and social development through structured learning experiences (Astuti & Erianti, 2022). However, learning outcomes in physical education remain varied among students, indicating that achievement is influenced by multiple interconnected factors. Previous studies have emphasized that students' success in physical education is not solely determined by instructional processes but is also affected by individual characteristics and lifestyle factors (Alhroub et al., 2024; AlKasasbeh & Akroush, 2024). Therefore, identifying factors that contribute to learning outcomes remains an important issue in physical education research.

Learning outcomes are generally influenced by both internal and external factors, including physical condition, nutritional behavior, and psychological readiness (Benny & Verma, 2022; Bethel, 2024). Among these factors, physical fitness is considered one of the most important determinants because it reflects the capacity of students to perform physical activities effectively. Students with good physical fitness tend to demonstrate better endurance, strength, and motor coordination, enabling them to participate actively in learning activities and achieve higher levels of performance (Cheong et al., 2022; Christiana et al., 2024). Consequently, physical fitness is frequently associated with improved educational outcomes in physical education settings.

Nutritional behavior, particularly breakfast habits, is another factor that may influence students' learning performance. Breakfast serves as an essential source of energy that supports physical activity, concentration, and cognitive functioning throughout the school day. Previous studies have reported that healthy eating habits contribute positively to students' academic achievement and overall well-being (Faruga-Lewicka et al., 2024; Gimenez et al., 2024). Nevertheless, empirical findings regarding the effect of breakfast habits on physical education learning outcomes remain inconsistent, suggesting that further investigation is required to clarify this relationship.

In addition to physical and nutritional factors, psychological aspects also contribute substantially to learning achievement. Self-confidence refers to an individual's belief in their ability to successfully perform tasks and overcome challenges. Within physical education contexts, students with higher self-confidence are more willing to participate actively, demonstrate skills, and persist when facing difficulties (Hladik et al., 2025; Huang et al., 2025). Furthermore, self-confidence may function as a psychological mechanism through which physical and behavioral factors influence learning outcomes, making it a potentially important mediating variable.

Several recent studies have demonstrated that physical fitness, nutritional behaviors, and psychological characteristics are associated with educational achievement (Iqbal & Syukriadi, 2024; Jacob & Panwar, 2023; Latino et al., 2023; Liu & Taresh, 2024). However, most previous investigations have examined these variables separately or focused primarily on direct relationships. As a result, limited attention has been given to understanding how physical fitness and breakfast habits may indirectly influence learning outcomes through psychological pathways such as self-confidence. This limitation restricts a comprehensive understanding of the mechanisms underlying student achievement in physical education.

Another limitation of previous studies concerns the contextual diversity of research settings. Most investigations have been conducted in different educational environments and student populations, making it difficult to generalize findings to specific school contexts. Moreover, empirical evidence integrating physical, behavioral, and psychological variables simultaneously remains limited, particularly among junior high school students. Therefore, examining these relationships within the context of SMP Negeri 7 Rambah Samo is important to provide evidence that reflects local student characteristics and educational conditions.

Based on these considerations, this study aims to analyze the direct, indirect, and simultaneous effects of physical fitness, breakfast habits, and self-confidence on physical education learning outcomes using a path analysis approach. The novelty of this study lies in the integration of physical, behavioral, and psychological factors within a single analytical model and in the examination of self-confidence as an intervening variable linking physical fitness and breakfast habits to learning outcomes. The findings are expected to enrich the theoretical understanding of learning achievement in physical education and provide practical implications for improving student performance through a more holistic educational approach.

Method

This study employed a quantitative approach with an associative design using path analysis to examine the direct and indirect relationships among physical fitness, breakfast habits, self-confidence, and physical education learning outcomes. The research was conducted at SMP Negeri 7 Rambah Samo, a junior high school selected because it represents students with diverse academic and physical activity backgrounds, making it suitable for investigating the interaction of physical, behavioral, and psychological factors in learning. The study population consisted of 146 students, and a sample of 50 students was selected using purposive sampling. The inclusion criteria included active enrollment in physical education classes, complete attendance during data collection, and willingness to participate in the study. Self-confidence was positioned as an intervening variable based on theoretical and empirical evidence suggesting that physical fitness and health-related behaviors may influence learning outcomes through psychological mechanisms related to students' perceptions of their abilities and readiness to perform learning tasks.

Data were collected using a physical fitness test, a breakfast habits questionnaire, a self-confidence questionnaire, and students' physical education report card scores as indicators of learning outcomes. Prior to hypothesis testing, all instruments were examined for validity and reliability, while the data were subjected to assumption testing, including normality, linearity, and multicollinearity analyses to ensure the suitability of the path model. Data analysis was performed using path analysis at a significance level of 0.05 to estimate direct, indirect, and total effects among variables. To strengthen the interpretation of mediation effects, indirect relationships were evaluated through path coefficient multiplication and significance testing within the structural model. The analytical model focused on explaining the contribution of physical fitness and breakfast habits to learning outcomes both directly and indirectly through self-confidence as a psychological mediator.

Results and Discussions

This study examined the relationships between physical fitness, breakfast habits, self-confidence, and learning outcomes in physical education among students at SMP Negeri 7 Rambah Samo. The analysis began with descriptive statistics to understand the general patterns of each variable, followed by assumption testing and path analysis to explore both direct and indirect effects. Overall, the findings show that physical fitness and self-confidence play important roles in shaping learning outcomes, while breakfast habits show a weaker and less consistent influence.

Table 1. Descriptive Statistics of Research Variables

Variable	N	Min	Max	Mean	Std. Deviation
Physical Fitness (X1)	50	3	5	3.24	0.85
Breakfast Habits (X2)	50	68	99	82.12	8.88
Self-Confidence (X3)	50	122	174	144.86	11.39
Learning Outcomes (Y)	50	75	97	86.00	7.04

Table 1 shows that students generally have moderate physical fitness and fairly good breakfast habits and self-confidence. Learning outcomes are also relatively high, with an average score indicating good academic performance in physical education. The variability across variables is acceptable, suggesting that the data are suitable for further analysis.

Table 2. Summary of Normality and Linearity Tests

Test	Relationship	Sig.	Conclusion
Normality	All variable pairs	> 0.05	Normal
Linearity	X1 to Y	0.133	Linear
	X2 to Y	0.431	Linear
	X3 to Y	0.370	Linear
	X1 to X3	0.166	Linear
	X2 to X3	0.192	Linear

As shown in Table 2, all variables meet the assumptions required for parametric analysis. The normality test indicates that all data are normally distributed, while the linearity test confirms that the relationships between variables follow a linear pattern. This means the data are appropriate for path analysis.

Table 3. Path Coefficients (Direct Effects)

Path	Beta	Sig.	Result
X1 to X3	0.800	0.000	Significant
X2 to X3	0.240	0.097	Not Significant
X1 to Y	0.435	0.009	Significant
X2 to Y	0.052	0.057	Not Significant
X3 to Y	0.564	0.002	Significant

Table 3 indicates that physical fitness has a strong and significant effect on self-confidence and also directly influences learning outcomes. Self-confidence itself significantly contributes to learning outcomes, making it an important mediating variable. In contrast, breakfast habits do not show a significant direct effect on either self-confidence or learning outcomes.

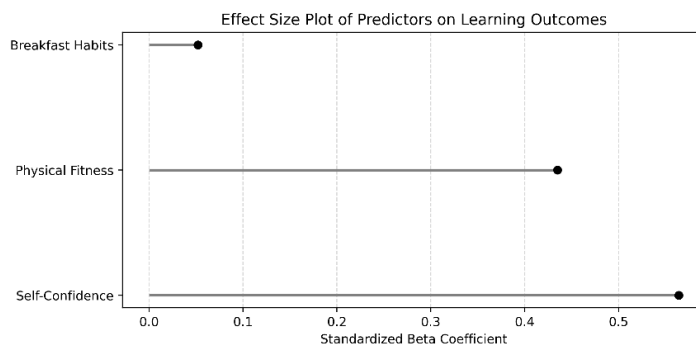


Figure 1. Effect Size of Physical Fitness, Breakfast Habits, and Self-Confidence on Physical Education Learning Outcomes

Figure 1 illustrates the effect size of each predictor variable on physical education learning outcomes. Self-confidence demonstrated the strongest effect ($\beta = 0.564$), indicating that students who possess greater confidence in their abilities tend to achieve better learning outcomes in physical education. Physical fitness was the second strongest predictor ($\beta = 0.435$), suggesting that students with higher levels of fitness are more capable of participating effectively in learning activities and performing successfully during assessments. In contrast, breakfast habits showed the smallest effect ($\beta = 0.052$), indicating a relatively weak contribution to learning outcomes compared with the other variables. These findings suggest that psychological and physical factors play a more substantial role in determining physical education achievement than breakfast habits alone, highlighting the importance of fostering both physical fitness and self-confidence to optimize student performance.

Table 4. Total Effects (Direct and Indirect Effects)

Variable	Direct Effect	Indirect Effect (via X3)	Total Effect	Contribution (%)
X1 to Y	0.435	0.451	0.886	78.49%
X2 to Y	0.052	0.135	0.187	3.49%

Table 4 highlights that physical fitness has the largest overall contribution to learning outcomes, both directly and indirectly through self-confidence. The indirect effect through self-confidence is even slightly stronger than the direct effect, emphasizing the mediating role of psychological factors. Meanwhile, breakfast habits contribute only minimally to learning outcomes, both directly and indirectly.

The findings indicate that physical fitness, breakfast habits, and self-confidence collectively explain 88.6% of the variance in physical education learning outcomes. This result demonstrates that students' achievement in physical education is shaped by the interaction of physical, behavioral, and psychological factors rather than by a single determinant. The high coefficient of determination suggests that the proposed model captures important dimensions of student performance. However, the remaining unexplained variance indicates that other factors, such as learning motivation, family support, teaching quality, and socioeconomic background, may also contribute to learning outcomes and should be considered in future studies.

Physical fitness was found to have a significant direct effect on learning outcomes. This finding supports the notion that students with better physical fitness possess greater endurance, strength, flexibility, and motor coordination, enabling them to participate more effectively in physical education activities. Consequently, physically fit students are more likely to complete learning tasks successfully and demonstrate superior performance during practical assessments. This finding is consistent with previous studies reporting that physical fitness positively contributes to learning achievement and supports students' participation in educational activities (Luo et al., 2022; Zulrafi et al., 2024). The results reinforce the view that physical readiness constitutes an important foundation for successful physical education learning.

In addition to its direct contribution, physical fitness exerted a substantial indirect effect through self-confidence. The path analysis showed that students with higher levels of physical fitness tended to exhibit stronger self-confidence, which subsequently enhanced their learning outcomes. This finding supports psychological perspectives suggesting that successful physical performance strengthens self-perception and increases confidence when participating in learning activities. Students who feel physically capable are generally more willing to demonstrate skills, engage in class activities, and persist when encountering challenges. Similar relationships have been reported by previous studies emphasizing the role of self-confidence and self-efficacy in facilitating educational achievement (Zulrafi et al., 2024; Zurc, 2024; Makaracı et al., 2023; Mukra et al., 2024). Therefore, self-confidence functions as an important psychological mechanism linking physical competence to academic success.

Self-confidence also showed a significant direct effect on learning outcomes, although its contribution was lower than the total effect of physical fitness. This result indicates that confidence alone may not guarantee high achievement, but it provides psychological support that enables students to optimize their abilities during learning activities. Students with higher confidence are generally less afraid of making mistakes, more willing to accept feedback, and more motivated to participate actively in class. These characteristics facilitate the learning process and contribute positively to educational achievement. The present findings are consistent with previous evidence demonstrating that psychological well-being, confidence, and positive self-perception are associated with improved participation and learning performance among students (Noerper et al., 2025; Papadopoulos et al., 2022).

Unlike physical fitness and self-confidence, breakfast habits did not demonstrate a significant direct effect on learning outcomes. This finding differs from several previous studies that reported positive associations between nutritional behaviors and academic performance (Christiana et al., 2024; Faruga-Lewicka et al., 2024; Gimenez et al., 2024). One possible explanation is that the present study measured breakfast habits primarily in terms of

regularity, without evaluating nutritional quality, caloric adequacy, or meal composition. Consequently, students who regularly consumed breakfast may not necessarily have received optimal nutritional benefits. Furthermore, the relatively homogeneous breakfast patterns among participants may have reduced variability and limited the statistical contribution of this variable. Nevertheless, breakfast habits still showed a small indirect effect through self-confidence, suggesting that healthy daily routines may contribute to students' psychological readiness even when their direct influence on learning outcomes is limited (Sepriani et al., 2024; Silva et al., 2022; Trajković et al., 2023).

This result indicates, the findings highlight the importance of integrating physical, behavioral, and psychological dimensions in physical education. The significant mediating role of self-confidence demonstrates that learning outcomes are influenced not only by students' physical capabilities but also by how they perceive and evaluate those capabilities. This finding addresses the research gap identified in previous studies, which predominantly focused on direct relationships among variables while paying limited attention to mediating mechanisms. The present study therefore contributes to the literature by providing an integrated model that explains how physical fitness and breakfast habits influence learning outcomes through self-confidence. From a practical perspective, physical education teachers should combine fitness-oriented programs with strategies that foster students' confidence through positive feedback, supportive learning environments, and meaningful participation opportunities (Wallace et al., 2023; Welis et al., 2024).

Conclusions

Based on the results of this study, it can be concluded that physical fitness, breakfast habits, and self-confidence collectively contribute to students' physical education learning outcomes, with physical fitness and self-confidence emerging as the most influential factors. Physical fitness has both a significant direct effect and a strong indirect effect through self-confidence, indicating that students who are physically fit tend to develop higher confidence, which in turn enhances their learning performance. Self-confidence also plays an important mediating role, strengthening the relationship between physical and behavioral factors and learning outcomes. Meanwhile, breakfast habits do not show a significant direct effect, although they still provide a small indirect contribution through self-confidence. Overall, this study highlights the importance of integrating physical, behavioral, and psychological aspects in improving students' achievement in physical education.

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